Supplementary material to paper "SA-OBS: a daily gridded surface temperature and precipitation dataset for Southeast Asia"

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1 Precipitation

1.1 Station comparisons

As background information and to verify the values in Fig. 5 of the main paper, Fig. S1 shows the scatter-plots between observed daily precipitation and gridded precipitation values for the corresponding grid squares for six selected stations in the region. The period for which the scatter-plots are made is 1998–2007. The gridded datasets used are SA-OBS, APHRODITE, CMORPH and TRMM (see the main paper for more details). The selection of stations is made in such a way that both SA-OBS and APHRODITE have a station in the corresponding grid square and the six stations sample the whole region. The stations shown are (top left to bottom right) Nakhon Sawan (Thailand), Phu Lien (Vietnam), Laoag Ilocos Norte (Philippines), Japura-Rengat (Indonesia), Lalos Toli-toli (Indonesia) and Kalumburu (Australia).

From these panels, it is clearly seen that all gridded datasets underestimate the observed precipitation. This is to be expected since the gridded data are taken to be area averages rather than point values. However, the amount of underestimation in SA-OBS is less than that of e.g. APHRODITE.

The bias calculated as

$$mean(Precip\_grid - Precip\_station), \tag{1}$$

the RMS differences calculated as

$$\sqrt{mean((Precip\_grid - Precip\_station)^2)}, \tag{2}$$

and the Pearson correlation coefficients are given in Table S1 for the same six stations. These metrics confirm the variations between the gridded datasets.

To check for a possible influence of the start and end time of the 24-hour period over which precipitation is accumulated, the same scatter-plots as Fig. S1 are created for 10-day sums. In these latter figures, a possible influence of the timing of the day should be reduced, compared to Fig. S1. The 10-day sums for the same six stations are shown in Fig. S2 with the corresponding statistics in Table S2. From this figure it is seen that there is still a larger scatter around

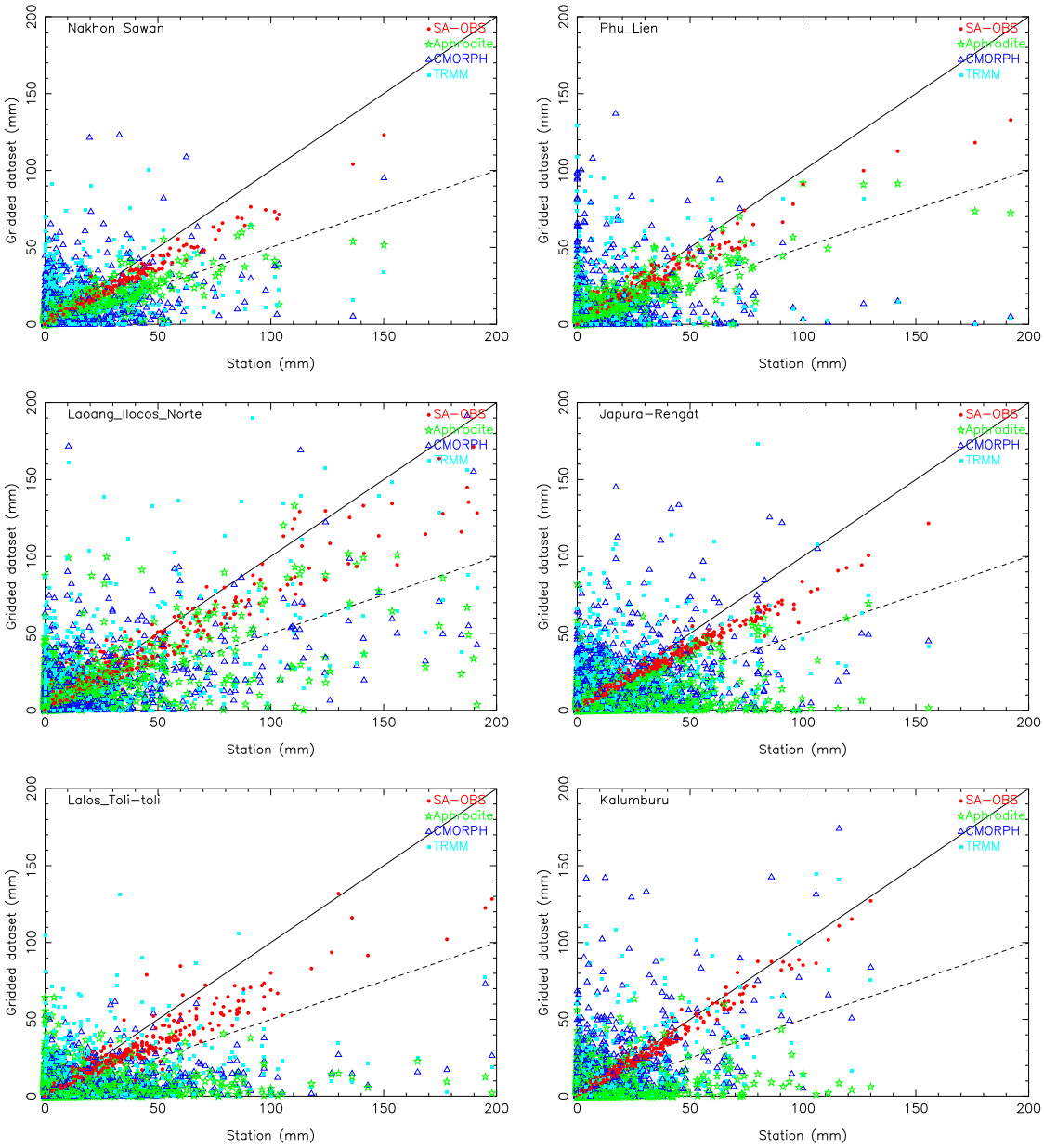

Figure S1: Scatter-plots between station precipitation and gridded precipitation for SA-OBS, APHRODITE, CMORPH and TRMM for six stations in the region. The solid lines indicate gridded values equal to the station values and the dashed lines where the gridded values are half that of the station values. Zero values appear absent in the SA-OBS results as a result of over-plotting from the other series.

Table S1: Bias, RMS and Pearson correlation coefficient for the same six stations as shown in Fig. S1 for each gridded dataset. Stations used are Japura-R = Japura-Rengat (Indonesia), Nakhon S = Nakhon Sawan (Thailand), Kalumburu (Australia), Laoang I N = Laoang Ilocos Norte (Philippines), Phu Lien (Vietnam) and Lalos T-t = Lalos Toli-toli (Indonesia).

	Japura-R	Nakhon S	Kalumburu	Laoang I N	Phu Lien	Lalos T-t
			Station Value			
Mean	6.612	3.221	3.497	5.811	3.248	6.578
			SA-OBS			
Mean	6.260	2.974	3.369	5.339	3.514	4.976
Bias	-0.352	-0.247	-0.127	-0.472	-0.190	-1.755
RMS	3.601	2.556	1.670	7.542	3.719	32.039
Corr	0.985	0.986	0.992	0.961	0.978	0.422
			APHRODITE			
Mean	3.519	2.888	1.805	5.156	3.729	3.645
Bias	-3.093	-0.333	-1.691	-0.655	-0.223	-2.902
RMS	12.981	6.090	11.094	16.316	7.013	34.400
c Corr	0.500	0.837	0.344	0.728	0.856	0.097
			CMORPH			
Mean	6.283	3.066	3.819	4.656	3.564	3.191
Bias	-0.329	-0.155	0.314	-1.155	-0.363	-3.434
RMS	14.316	9.457	10.966	16.339	13.520	33.834
Corr	0.450	0.501	0.567	0.719	0.294	0.202
			TRMM			
Mean	6.903	0.706	3.476	6.163	3.970	5.025
Bias	0.291	-2.515	-0.022	0.353	-0.174	-1.593
RMS	14.895	10.007	9.677	15.628	13.089	34.195
Corr	0.426	0.453	0.636	0.739	0.344	0.165

the station values for the different datasets, indicating the timing of the day is only influencing the results slightly.

1.2 Comparison with GPCC

The comparison between monthly precipitation sums from GPCC Full Reanalysis Version 7 and from the other gridded datasets SA-OBS, APHRODITE, CMORPH and TRMM for average January and July conditions, where all datasets are aggregated to the coarser 0.5° GPCC resolution are shown in Fig. S3. The comparison period is over the 1998–2007 period and shows a general good agreement between the datasets.

In the paper introducing the APHRODITE dataset by Yatagai et al (2012), a comparison is made between APHRODITE and GPCC for the whole APHRODITE domain. Although they showed only January and July 1998, it is clear from their analysis that the largest differences between GPCC and APHRODITE are in the Southeast Asia area. These differences are similar to the ones we find when re-doing the analysis (see Fig. S3).

Table S2: Bias, RMS and Pearson correlation coefficient for the same six stations as shown in Fig. S2 for each gridded dataset based on 10-day sums. Stations used are Japura-R = Japura-Rengat (Indonesia), Nakhon S = Nakhon Sawan (Thailand), Kalumburu (Australia), Laoang I N = Laoang Ilocos Norte (Philippines), Phu Lien (Vietnam) and Lalos T-t = Lalos Toli-toli (Indonesia).

	Japura-R	Nakhon S	Kalumburu	Laoang I N	Phu Lien	Lalos T-t
			Station Value			
Mean	66.100	32.290	34.920	58.249	38.764	71.907
			SA-OBS			
Mean	62.592	29.811	33.661	53.518	38.163	48.821
Bias	-3.508	-2.479	-1.262	-4.731	-2.295	-21.781
RMS	14.086	8.282	4.688	25.965	13.626	123.597
Corr	0.981	0.988	0.998	0.983	0.984	0.442
			APHRODITE			
Mean	35.180	28.956	18.308	51.674	37.372	36.459
Bias	-30.920	-3.334	-16.679	-6.576	-4.243	-34.731
RMS	57.234	19.823	47.796	64.438	26.006	133.906
Corr	0.575	0.902	0.700	0.850	0.930	0.262
			CMORPH			
Mean	62.868	30.736	37.842	46.671	35.725	31.910
Bias	-3.232	-1.554	2.696	-11.578	-4.102	-40.979
RMS	55.588	30.395	38.694	67.742	49.613	134.756
Corr	0.465	0.728	0.792	0.837	0.601	0.303
			TRMM			
Mean	69.052	34.605	34.530	61.773	39.801	50.220
Bias	2.952	2.244	-0.490	3.524	-1.680	-21.622
RMS	52.965	29.607	28.966	56.073	37.106	129.540
Corr	0.533	0.753	0.881	0.874	0.781	0.297

2 Temperature

2.1 Station comparisons

The same type of figure as Fig. S1 has been created for daily mean temperature in Fig. S4. Six stations are selected in such a way that both SA-OBS and APHRODITE have a station in the corresponding grid square and the six stations sample the whole region. Stations shown are (top left to bottom right) Nakhon Phanom Agromet (Thailand), Phu Lien (Vietnam), Aparri Cagayan (Philippines), Kijang-Tanjung Pinang (Indonesia), Polonia Medan (Indonesia) and Kalumburu (Australia). Only 2 gridded datasets are used for temperature. It is clear that the spread around the station values is larger for APHRODITE than for SA-OBS.

Table S3 shows also the bias, RMS difference and Pearson correlation coefficients for mean temperature. It is seen that especially in Northern Vietnam (Phu Lien) the differences between the station values and APHRODITE are large.

Table S3: Bias, RMS and Pearson correlation coefficient for the same six stations as shown in Fig. S4 for each gridded dataset. Stations used are Nakhon P A = Nakhon Phanom Agromet (Thailand), Kalumburu (Australia), Aparri C = Aparri Cagayan (Philippines), Phu Lien (Vietnam), Polonia M = Polonia Medan (Indonesia) and Kijang-T P = Kijang-Tanjung Pinang (Indonesia).

	Nakhon P A	Kalumburu	Aparri C	Phu Lien	Polonia M	Kijang-T P
			Station Value			
Mean	26.660	27.248	27.124	23.452	26.820	34.184
			SA-OBS			
Mean	26.294	27.480	27.001	24.030	26.686	26.246
Bias	-0.319	0.254	-0.086	0.575	-0.135	-7.938
RMS	0.568	0.527	0.137	0.668	0.519	44.016
Corr	0.989	0.991	0.999	0.998	0.886	0.237
			APHRODITE			
Mean	26.055	27.176	26.952	23.559	27.008	26.721
Bias	-0.570	-0.029	-0.034	0.110	0.187	-7.463
RMS	0.878	0.991	0.513	0.684	0.835	44.065
Corr	0.977	0.956	0.972	0.991	0.691	0.113

2.2 Comparison with CRU

The comparison between mean temperature from CRU TS 3.24 and from the other gridded datasets SA-OBS and APHRODITE for average January and July conditions, where SA-OBS and APHRODITE are aggregated to the coarser CRU 0.5° resolution are shown in Fig. S5. The comparison is over the 1981–2007 period and shows a general good agreement between the two datasets.

These monthly means show differences of up to several degrees on the monthly level. It is expected that the differences might even be larger on the daily level.

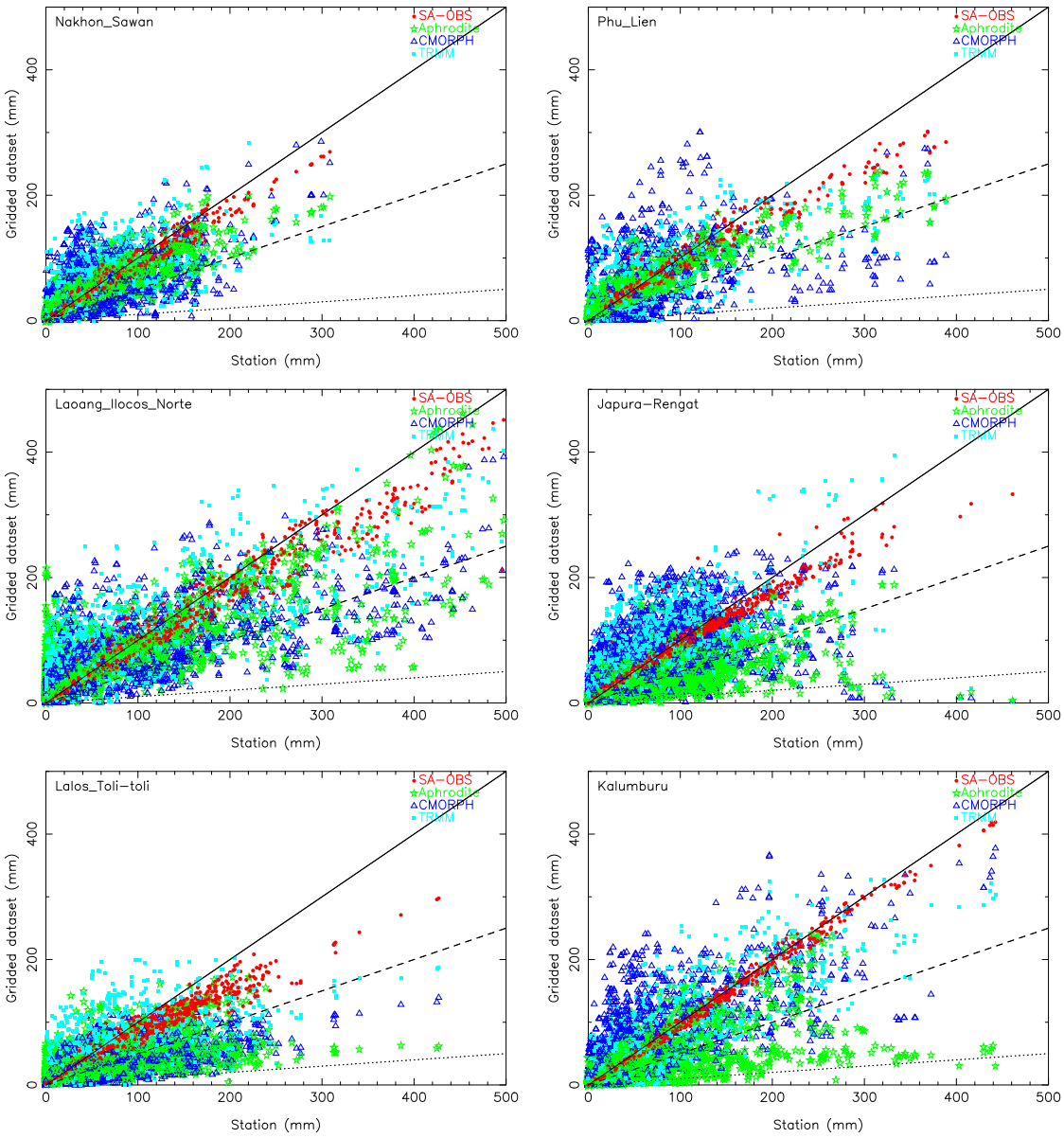

Figure S2: Scatter-plots between 10-day sums of station precipitation and 10-day sums of gridded precipitation for SA-OBS, APHRODITE, CMORPH and TRMM for six stations in the region. The solid lines indicate gridded values equal to the station values, the dashed lines where the gridded values are half that of the station values and the dotted lines indicate a factor 10 difference. Zero values appear absent in the SA-OBS results as a result of over-plotting from the other series.

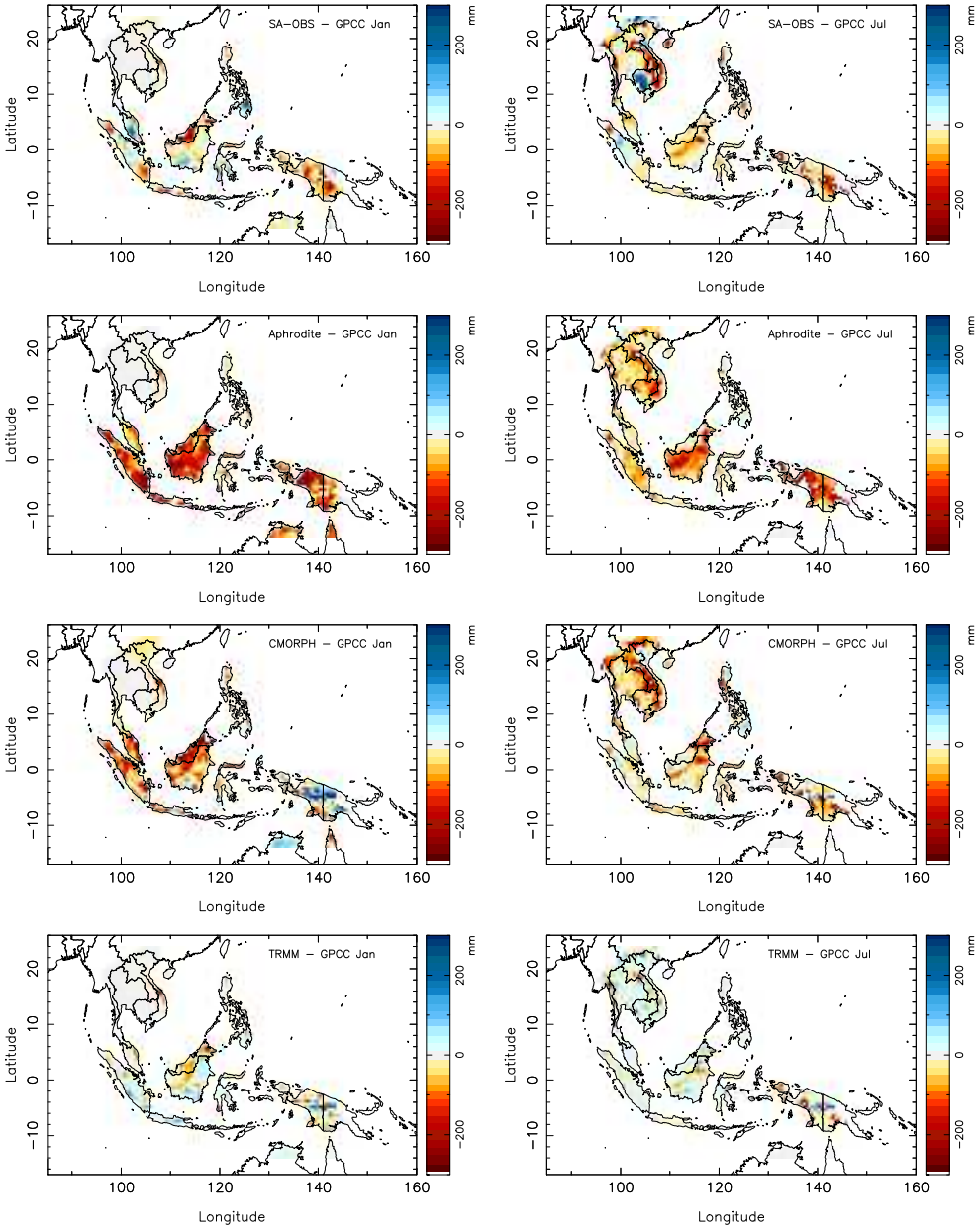

Figure S3: Comparisons between GPCC monthly precipitation and the other gridded datasets SA-OBS, APHRODITE, CMORPH and TRMM for January (left) and July (right) over the period 1998–2007.

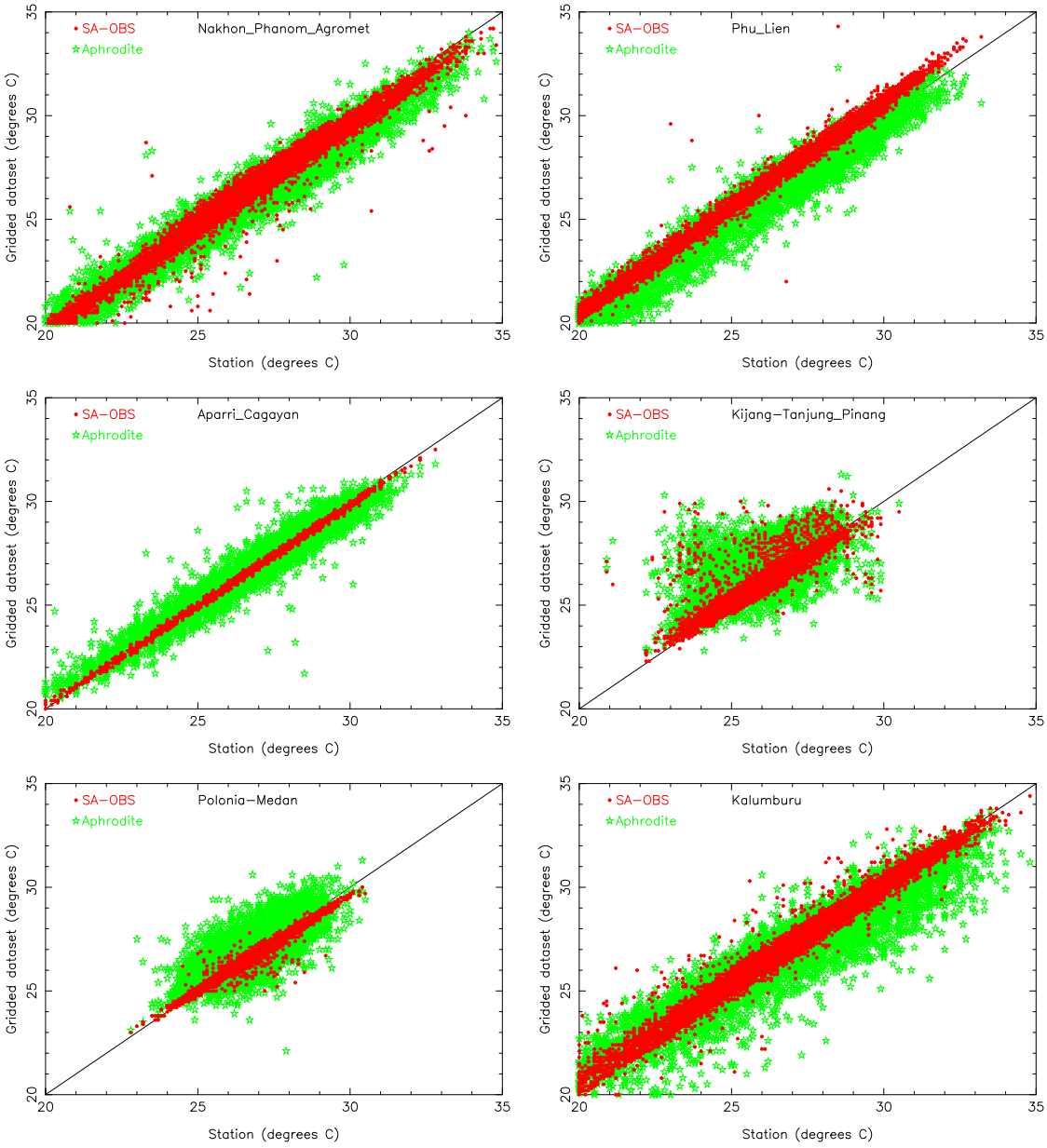

Figure S4: Scatter-plots between station mean temperature and gridded mean temperature for SA-OBS and APHRODITE for six stations in the region. The solid lines indicate gridded values equal to the station values.

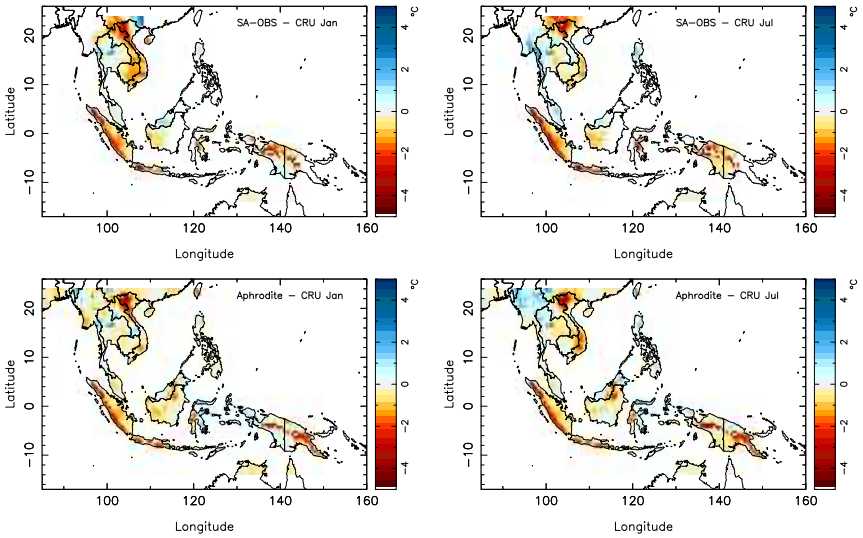

Figure S5: Comparisons between CRU and the other gridded datasets SA-OBS and APHRODITE for average mean temperature in January (left) and July (right) over the period 1998–2007.